Annual Report
Arizona Iceberg Lettuce Research Council
2002-2003

Title: Breeding High Quality Iceberg Lettuce Cultivars for Arizona
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Cooperating Personnel
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For the 2002-2003 season, four plantings were made in the Yuma area. Three plantings were made at the Yuma Agricultural Center and one in a commercial field.

Planting 1, at the Center, was made on 16 September. Selections were made in families from the following crosses: Autumn Gold x Tiber F_5 (4 selections), 87-714-8 x Autumn Gold F_5 (10 selections), and 87-714-8 x Autumn Gold F_4 (2 selections). 87-714-8 and Tiber are highly resistant to tipburn. Autumn Gold is a fall cultivar from a cross between Empire and Vanguard 75 and is resistant to lettuce mosaic. Selections were made based on slow-bolting, good head formation, color, size, and absence of tipburn. Selections were made on 3 December.

Additional selections were made in BCF_2 families from Waldmann's Green x 99-1101. This is a green leaf lettuce cross. Ten selections were made from one row with darkest green color, least bolting tendency, and uniform coloring. Romaine type selections were made in F_4 families of PI 491224 x Darkland, a cross made for resistance to lettuce dieback. Forty-one selections were made in five families; these had no bolting and shiny green leaves.

Planting 2, in a commercial field east of Yuma, was not evaluated.

Planting 3, at the Center, was made on 8 October and evaluated on 21 January. Of four family groups from crosses with slightly downy mildew tolerant lines, selections were made only in F_3 families of Winterhaven x 95-109. There was no downy mildew in the plot so selections were made for Winterhaven type with moderate size and no spiralling. Seventeen selections were made in three rows. From the cross Winterhaven x Pacific, made to transfer big vein resistance to a Winterhaven type, 42 selections were made in seven F_3 families.

For powdery mildew resistance, 10 selections were made in F_3 families of the cross Winterhaven x Big Boston. Big Boston showed the highest level of resistance of resistant parents grown in the plot. Selections were made of plants free of mildew lesions, for backcrossing to Winterhaven, since none approached head lettuce type.

Planting 4, at the Center, was planted 2 December, as a tipburn resistance experiment. The tipburn resistant cultivar Tiber was bred from a cross between Vanguard 75 and Salinas. Tiber is most suitable for production in the coastal districts of California. F_3 families of the cross Vanguard 75 x Salinas were re-evaluated last year to identify a desert type TB resistant cultivar. Four F_3 families were identified with tipburn resistance. These and several other lines from several crosses, were planted this year. The four were again identified as resistant (Table 1). These are being checked for LMV resistance and increased for trial. Two F_4 families from the cross Calicel x 87-714-1 also showed resistance and are being increased for trial

At the US Agricultural Research Station in Salinas, applicable research was conducted in two areas:

1. Powdery mildew- We are developing a greenhouse procedure for screening for resistance and selecting for resistance in segregating populations.

2. Fusarium root rot, a.k.a. Fusarium wilt. We collaborated with Mike Matheron and Barry Tickes, UACE in determining the race of the pathogen present in Yuma and evaluating potential sources of resistance to the disease. FRR race differentials were obtained and challenged in one naturally-infected field test in the Yuma in December 2002, and in a series of 10 greenhouse tests inoculated with either a Yuma isolate (nine tests) or a California isolate (one test). Results to date indicate that FRR race 1 is present in Yuma and that the iceberg cultivar Salinas is the best known source of resistance to this race. The data are summarized in Table 2.

3. No progress was made in the proposed work on lettuce aphid breeding. A privately held utility patent protects the only known gene in lettuce for resistance to this insect. The patent owner denied permission for release of this gene in breeding lines developed by USDA-ARS. We have screened publicly available germplasm for unique sources of resistance to lettuce aphid.

Table 1. Tipburn ratings, F_3 families from Vanguard 75 x Salinas. Percent plants with tipburn. Ratings for two years.

Family	Plant type	% TB 2001-2	% TB 2002-3
82-1809-3	Enclosed	10	10
82-1809-5	Enclosed	0	60
82-1809-9	Enclosed	5	0
82-1809-10	Enclosed	0	20
Calicel		70	100

Table 2. Summary of reactions of Fusarium root rot differentials and selected cultivars in a naturally-infected field test and greenhouse tests.

	Race			Field	
Entry	1	2	3	(Yuma)	Greenhouse
			Differential		
Costa Rica No. 4	R	S	S	R	R
Banchu Red Fire	S	R	S	–	S
Patriot	S	S	S	S	S
			Cultivars		
Salinas				R	R
Vanguard				S	S